Powder Metallurgy Steel

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Discover the Truth of Material

Purpose:

Test porosity and observe the microstructure of powder metallurgy samples.
Powder metallurgy involves forming and sintering metal powders (or mixtures of metal and non-metal powders) to produce metal components or materials. Key advantages include the ability to form special materials (e.g., refractory metals, pseudo-alloys, porous materials) and ensure uniform composition distribution. Samples undergo cutting (CT-250V), mounting (TJ2228 cold-curing resin and ThetaVAC-2 vacuum cold mounting machine), grinding/polishing (Alpha610), and porosity measurement via metallographic microscope (MN80). Etching with 4% nitric acid alcohol solution reveals the microstructure.

Recommended parameters for different specimen size				
Sample size/ diameter (mm)	25	30	40	50
Individual force loading mode, individual sample pressure force (N)	-5	0	+(5~10)	+(5~10)

*Standard pressure: ϕ30mm (adjust according to sample size).

Recommended Equipment and Consumables (select grinding/ polishing consumables based on sample conditions):



CT-250V Manual Cutting Machine

Cutting

Equipment	CT-250V Manual Cutting Machine	
Cutting wheel	A30 alumina abrasive cut-off wheel	Order No: 01.01.350
Cutting coolant	TJ1410 Cutting Coolant	Order No: 01.07.857
Fixture	Horizontal push fixture	
Cutting method	Manual cutting	
Cutting parameters	Feed rate	Manual operation
	Cutting wheel speed	2800rpm

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ThetaVAC–2 Vacuum Cold Mounting Machine

Cold Mounting

Equipment	ThetaVAC–2 Vacuum Cold Mounting Machine
Resin pouring pressure (KPa)	–60
Circulating pressure (KPa)	–60
Circulating vacuum holding time (s)	60
Number of vacuum cycles	3
Cold mounting resin	TJ 2228 Epoxy Slow–Cure Resin A：Order No：02.04.871
	B：Order No：02.04.872
Mixing ratio	A：B=2:1
Curing Time	8–12h

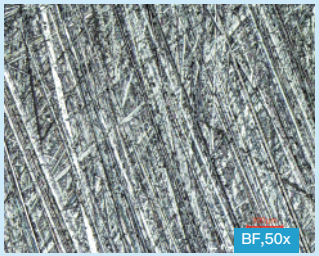
Basic Guide

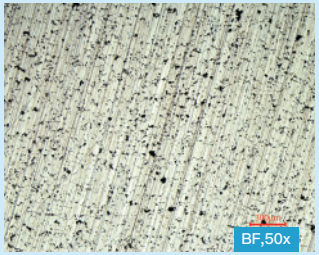
- **Cutting**
  1.Use a resin–bonded alumina cutting wheel for powder metallurgy steel. Refer to the Trojan Cutting Guide for specific models.
  2.For automated cutting, select pulse mode with a maximum cutting speed ⩽0.25 mm/s.
- **Mounting**
  Use high–edge–retention cold/hot mounting resin.
- **Grinding**
  1.Begin with P400 silicon carbide sandpaper until the sample surface is flat and cutting damage is fully removed.
  2.Continue fine grinding with a POS disc + 9 μm diamond polishing suspension.
  3.Clean the sample, sample holder, and hands after each grinding step.
- **Polishing**
  1.Clean the polishing cloth, sample holder, and hands before polishing. Repeat cleaning after each step.
  2.Do not mix polishing disks with different abrasive particle sizes.
  3.Rinse the sample surface with isopropyl alcohol and dry with a blower to remove residue and prevent corrosion.
  4.After each polishing step, inspect under a metallographic microscope to ensure scratch size matches the abrasive grit and direction is random.
  5.Clean polishing cloths with running water and a soft brush after use, then air–dry.
  6.Dedicate polishing cloths used for powder metallurgy steel exclusively to such samples.

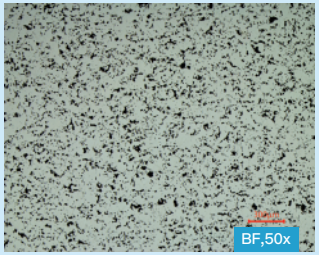
Preparation Procedure——Powder Metallurgy Steel

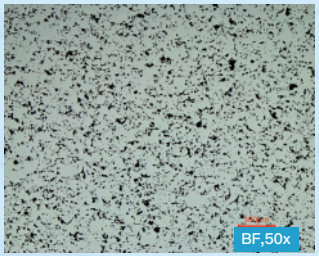
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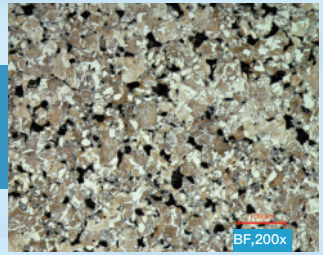
1	P400 DiaRe resin bond diamond grinding disc	Water	30N	50/300rpm	Until plane
2	POS disc	9μm PD-WT Polycrystalline diamond polishing suspension	30N	50/150rpm	5min
3	YS-JP	3μm PD-WT Polycrystalline diamond polishing suspension	30N	50/150rpm	5min
4	ET-JP	1μm PD-WT Polycrystalline diamond polishing suspension	20N	50/150rpm	1min









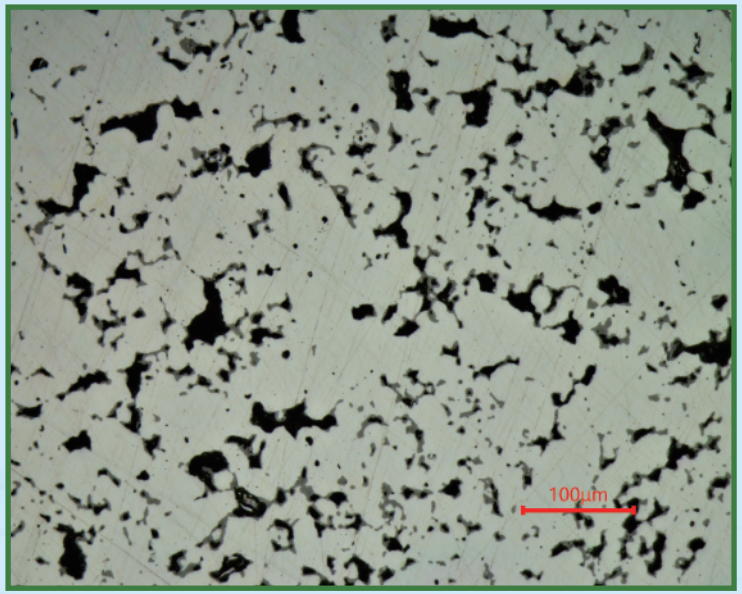


Immerse in 4% nitric acid alcohol solution for 10—60 seconds depending on carbon content to reveal the microstructure.

Powder Metallurgy Steel-Polishing defect samples

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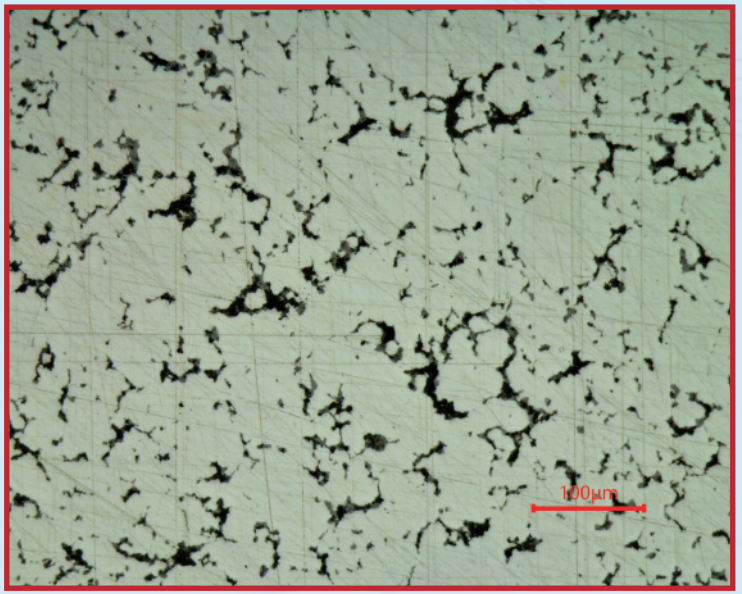
Photos of qualified polished samples



Micrograph after polishing with YS–JP White Fiber Polishing Cloth + 3μm PD–WT polycrystalline diamond suspension (200X magnification)

- Pores are fully exposed with clear edges.

Photos of unqualified polished samples



Micrograph after polishing with YS–JP White Fiber Polishing Cloth + 3μm PD–WT polycrystalline diamond suspension (200X magnification)

- Pores are fully exposed with clear edges;
- Solution: Increase polishing time with the YS polishing cloth.